Beyond constructivism: An ecological approach to e-learning

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The last four decades of the 20th century saw the growth of ecological perspectives across the disciplines. This period also saw the rapid penetration of computing and information technology into every sphere of human activity, culminating with the internet and digital convergence of all media. The juxtaposition of an emergent ecological philosophy together with the information technology explosion poses some fascinating issues for education. There are particular implications for the fashionable notions of constructivist and student centred approaches to learning, which constitute a zone of comfortable dogma. In this presentation I propose an ecological approach to e-learning that goes beyond the comfort zone of constructivism.

The key idea is that teaching/learning is an ecosystemic process of transforming information into knowledge, in which teacher, subject and student relationships are embedded or situated in a context where complex interacting influences shape the quality of learning outcomes. This perspective ventures into a new ecology of cognition and learning known as enactivism. It raises the question: Can e-learning provide an effective substitute for the embedded contextual relationships that characterise authentic and deep learning environments? In other words, can virtual or tele-presence ever be a complete replication of embodied, ecological presence?

Keywords: ecology, constructivism, interactivity, enactivism

Introduction

The last four decades of the 20th century saw the growth of ecological perspectives across the disciplines. The postmodern sciences of complexity, chaos and cognitive biology (Bateson 1972; Capra 2003; Maturana & Varela 1987) emphasised a complementary and integral mode of seeing wholes together with parts, and the connections that link separations. This period also saw the rapid penetration of computing and information technology into every sphere of human activity, culminating with the internet and digital convergence of all media. Ironically, the scientific worldview of Newton and Descartes that built the modern mechanised world, in a silicon incarnation of networked machines, is now the main harbinger of ecological consciousness to the West (Berman 1981; Kelly 1994). The juxtaposition of an emergent ecological philosophy (that goes beyond the confines of Western dualistic and mechanistic thought), together with the information technology explosion, poses some fascinating issues for education. There are particular implications for the fashionable notions of constructivist and student centred approaches to learning, which constitute a zone of comfortable dogma for researchers and practitioners. In this presentation of a work in progress, I sketch an overview of these issues, and propose an ecological approach to e-learning that goes beyond the comfort zone of constructivism.

As an idea, the ecological is beginning to surface in e-learning literature, emerging from earlier concepts of information ecology (Nardi & O'Day 1999), learning ecology (Brown 2000), communities of practice (Wenger 1998; Barab et al. 1999), networks as ecosystems (Kelly 1994), and evident in texts such as *Deep Learning for a Digital Age* (Weigel 2001) and *e-Learning for the 21st Century* (Garrison and Anderson 2003). There are however different flavours of ecological approaches, and it is important to critique these emerging perspectives in the light of a more authentic mode of thinking ecologically about education and reality. Much of the information technology and e-learning literature that claims an ecological approach either ignores or is unaware of this paradigm.

For example McCalla (2004) has recently proposed an ecological approach to the design of e-learning environments, which involves attaching models of learners to the learning objects they interact with, and then mining these models for patterns that are useful for various purposes. There is no mention of engagement with other learners or the mediating voice of a teacher. We are presented with a neo-

Darwinian attempt to apply artificial intelligence to education. Although a constructivist philosophy is espoused, the assumption is that mind is somehow contained within an individual, and learning can be reduced to quantified actions and behaviours such as keystrokes and 'dwell time' on a particular object. Presumably these human elements have been reduced to other kinds of disembodied 'objects' that, like the earth, can be 'mined' for useful resources. In this sense the approach is the antithesis of the ecological. It is time that an authentically ecological approach was brought to bear on e-learning, as antidote to the excesses of modernistic reductionism that plague much of the literature on instructional design, learning objects, and e-learning environments.

The ecological zone

Here we enter the zone of confluence between the emergent ecological idea and networked information technologies. Turkle has pointed out that on the internet, 'we are encouraged to think of ourselves as fluid, emergent, decentralised, multiplicious, flexible, and forever in process.' (Turkle 1995:263). The internet thus concretises the Lacanian notion that identity is constituted in language, or in other words, a new technology gives form to an abstract psychological theory. In the same way, networked information technologies can be seen as the physical manifestation of an ecological epistemology, most clearly stated by Bateson (1972, 1979).

Bateson insists that what we think of as an individual mind is but one part of a larger and interconnected web of mental processes. These mental processes are exchanges and transformations of information. Information in Bateson's language is defined as "a difference that makes a difference" (Bateson 1972: 286). It is the totality of these interacting differences, as they travel and undergo transformation in a circuit of sensory and communicative pathways, that constitutes the mind or mental system of which individual consciousness is only a part. Mental activity or cognition is thus the encoding and interpretation of information exchanges that are characteristics of an *entire system*, rather than the function of an individual that is separate from a cognitively inert world. What we take for granted as our individual mind or consciousness is what may be called an *emergent property* of the larger mental systems in which we are embodied:

> The individual mind is immanent but not only in the body. It is immanent also in pathways and messages outside the body; and there is a larger Mind of which the individual mind is only a subsystem. This larger Mind is comparable to God and is perhaps what some people mean by 'God', but it is still immanent in the total interconnected social system and planetary ecology (Bateson, 1972: 436).

This conception of mental process has somewhat radical implications for education. The notion of social and ecological systems as possessing mental characteristics runs deeply contrary to our accepted understandings of intelligence as a function of the individual brain. Since the entire edifice of higher education is constructed on the belief that cognition, learning and intelligence are properties of decontextualised individuals who are separate entities from the teacher and each other, any way of thinking that proposes otherwise presents a rather unique challenge.

The premise that an individual mind is an entity that functions separately from the world is deeply ingrained in commonsense thinking, and thus the counter intuitive encounter with Bateson's thinking leads one to presume either that Bateson is mad, or that we are too stupid to understand him. It is very difficult to grasp the notion of information as 'news of difference' and then even more problematic to extend this to an understanding of the world as being constituted by mental events in which information is exchanged and transformed in multiple pathways inside and external to the body. But as Bowers and Flinders (1990) argue:

> The challenge here is not to prejudge Bateson or ourselves; rather it is to explore whether the explanatory power of his most basic ideas helps us escape the Cartesian orientation that prevents us from understanding the patterns that connect us to each other and to the natural ecosystems …. It is the system (the aggregate of interacting elements), rather than the autonomous and reflective individual, that must be understood as possessing "mental characteristics." (p. 97)

Perhaps the most important implication here is that the teaching/learning setting (the classroom, the lecture theatre, the e-learning environment, the department, and even the institution itself) can be viewed as a system that is characterised by mental events. The dialogical processes of language and communication between teachers, students and the subject within these nested contexts can be seen as the pathways in which the processes of information exchange and transformation occur. Learning and the development of knowledge and understanding emerge from the complex interactions between the different parts as information travels around the physical and mental pathways that constitute the total ecology of mind or mental system.

The central question for exploring this relationship is: in what ways do ecological systems and mental systems share the same characteristics? How can we conceive of a teaching/learning setting as an ecosystem? Is ecology just a metaphor for thinking about a process or does a networked learning environment function like an ecosystem? These questions have been explored in more detail in Frielick (2004). In summary, the key idea is that teaching/learning is an *ecosystemic process of transforming information into knowledge, in which teacher, subject and student relationships are embedded or situated in a context where complex interacting influences shape the quality of learning outcomes*. This perspective goes beyond the comfort zone of constructivism, into a new ecology of cognition and learning known as enactivism (Varela, Thompson & Roche 1991; Davis, Sumara & Kieren 1996).

An ecological model of learning/teaching

The ecosystemic process of transforming information into knowledge can be modelled as follows. The model is essentially a summary of the main findings of the student learning research paradigm emerging from the work of phenomenography (Marton & Booth 1997; Prosser & Trigwell 1999), the relational perspective of Ramsden (1987), and the systems / constructive alignment approach of Biggs (1999). These seminal findings are integrated with the Batesonian epistemology and enactivist ecology of cognition noted above in a complex, ecological model of learning/teaching:

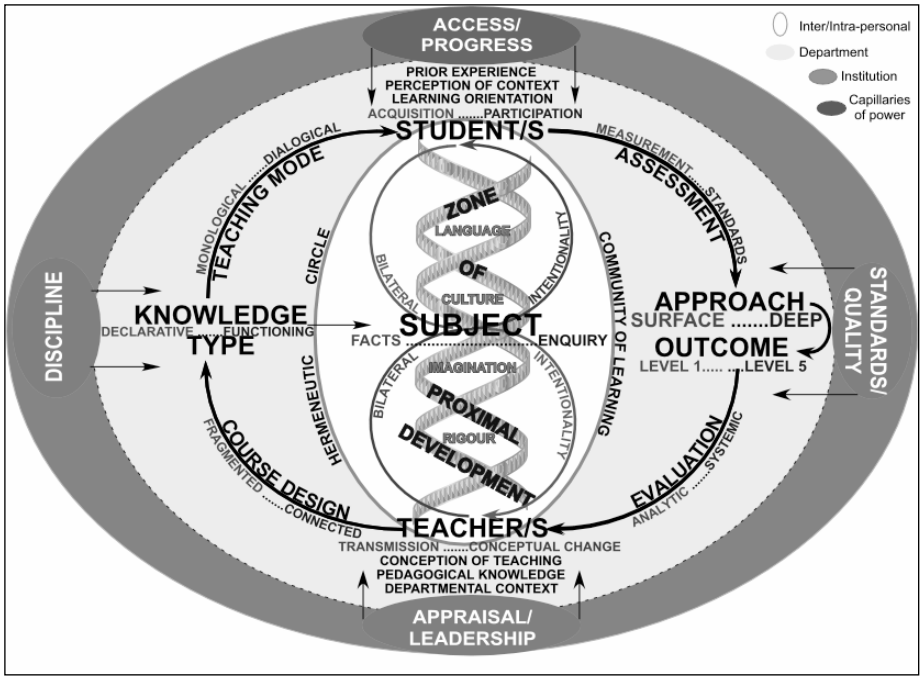

Figure 1: Ecological model of learning/teaching (Frielick 2004)

Implications for e-learning

This presentation examines the implications of ecological and enactivist understandings of mind for e-learning. It explores the question: Can e-learning provide an authentic substitute for the embedded contextual relationships that characterise authentic and deep learning environments? In other words, can

virtual or tele-presence ever be a complete replication of embodied real presence? Here we begin to confront the limitations of the Internet, argued most clearly by Dreyfus (2001):

> As long as we continue to affirm our bodies, the Net can be useful to us in spite of its tendency to offer the worst of a series of asymmetric trade offs: economy over efficiency in education, the virtual over the real in our relation to things and people, and anonymity over commitment in our lives (p106).

However, Garrison and Anderson (2003) argue persuasively for the ability of e-learning to recreate social, cognitive and teacher presence through the six forms of interaction supported by e-learning technologies. We must also acknowledge that the rapid development of technologies such as videoconferencing, which strongly enables tele-presence, and the resurgence of interest in 'virtual teachers' (Plantec 2004) pose significant challenges for the idea that embodied presence is necessary for learning. Depending on the subject and the required level of competence, a case could possibly be made for the effectiveness of tele-presence as a substitute for embodied presence. Dreyfus concedes as much in his argument, and acknowledges that e-learning might be effective for the lower levels of skill acquisition in his framework. E-learning can at best assist learners to a level of competence. But *expertise*, or *deep learning* in the ecological model illustrated above, can only be gained in the real presence of intercorporeal engagement with a master or expert.

The presentation will engage participants in an exploration of the ecological model of teaching/learning in higher education, as a basis for further investigation of the implications of this authentic ecological perspective for e-learning. In this short adventure we explore possibilities beyond the comfort zone of constructivism and examine the limitations of e-learning for enabling deep approaches to student learning.

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